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U.S. Department of Transportation

Federal Aviation Administration

PURCHASE DESCRIPTION

INTEGRATED COMMUNICATIONS SWITCHING SYSTEM

PHASE 1A - TYPE 3

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PURCHASE DESCRIPTION

ICSS PHASE 1A TYPE 3

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1.0 Scope.

This purchase description sets forth the requirements for the Phase 1A Type 3 Integrated Communications Switching System (ICSS), which shall provide diverse communications capabilities to Automated Flight Service Station (AFSS) specialists. These communications can be divided generally into two categories: ground-ground communications and air-ground communications

The Type 3 ICSS shall provide all necessary interfaces for connections to telecommunications circuits and radio transmitters/receivers to support the operational requirements of the AFSS.

The Type 3 ICSS shall be capable of providing up to 80 ATC positions.

The Type 3 ICSS shall be provided the capability to interface with up to 75 interfacility trunks, 30 DDD/FTS/Autovon trunks, 75 IN-WATS/FX trunks, 75 radio channels.

The Type 3 ICSS shall be constructed from hardware modules which will be ordered by the Government in configurations to meet the operational requirements of each AFSS.

1.1 General.

The ICSS shall be the principal tool for establishing air traffic control communications in those ATC facilities where it is installed. These communications consist of ground/ground links and air/ground communications via radio.

The ground/ground portion of ICSS shall enable operators to talk both to other operators at the same facility, in a mode called intercom, and with operators (including parties calling Flight Service Stations) at remote locations, using interphone service. Intercom switching and connections shall be performed entirely within ICSS. Interphone will require interface with and use of various trunk telephone services.

ICSS shall also provide air/ground communications between operators and pilots in aircraft. The transmission medium shall be radio, and ICSS shall be required to interface with both local and remote Government furnished transmitters and receivers for this purpose.

The basic system elements of the ICSS shall be as follows:

a. ATC position equipment
b. switching network equipment for intercom, interphone and radio
c. interface equipment for trunk lines, radio, recorders and maintenance positions
d. configuration control equipment
e. maintenance/diagnostic support equipment
f. power system equipment
g. Automatic Call Distribution (ACD)

ATC position equipment is the operator's tool for initiating and responding to communication. This equipment includes a headset with both a microphone and earphones, a loudspeaker, pushbuttons for operator control and various system status displays. Pushbuttons perform a number of functions. When the operator wants to initiate a call, he may use one of several methods, depending upon the system configuration and the destination of the call. His position may include a number of Direct Access pushbuttons. By pushing such a button, the operator can directly call the particular intercom or interphone position designated for that button. Similarly, the position might include buttons providing for transmission and receipt on various radio frequencies. If the operator wants to call a ground position for which he has no Direct Access pushbutton, he can use an Indirect Access numeric keypad to dial a code number for that party. When an incoming call is received, visual and audible signals alert the operator, and he can answer by pushing the appropriate button. Finally, there are numerous special functions provided by other buttons.

System status displays include indicator lights which may flash, wink, flutter or stay on to indicate incoming calls, busy lines, calls in queue, etc. Printed or optoelectronic displays shall be provided adjacent to Direct Access pushbuttons to specify the corresponding parties who can be reached with this single stroke capability. Similarly, displays next to Radio keys shall indicate the specific radio frequencies provided.

Switching network equipment shall be provided to deliver voice signals through the system from the originators to their destinations. In the case of intercom service, these connections are made internally within ICSS. Interphone conversations either enter or leave the system over telephone trunks. The ICSS shall be responsible for routing these calls to their proper destinations. Similarly, radio conversations enter and leave the ICSS via radio transmitters and receivers.

Because of this need to communicate over telephone trunks and radios, appropriate interface equipment must be provided. Additional interfaces for tape recorders and maintenance equipment shall also be supplied.

Configuration control equipment shall provide for straightforward changes to the system configuration. Examples of these changes include reassignment of Direct Access pushbutton paths and changes to the radio frequencies accessible from each position.

Maintenance and diagnostic support equipment shall facilitate efforts to meet stringent availability requirements.

Power system equipment shall include uninterruptible power supplies which can continue to power ICSS in the event of a commercial power failure.

Automatic Call Distribution Equipment shall be provided to receive incoming calls from trunk circuits and route these calls to ATC positions or automated response equipment.

Because of the importance of voice communications in air traffic control, ICSS reliability is critical. No single hardware failure shall cause the loss of more than one ATC position. Positions shall "fail soft", with communications capabilities continuing on a reduced basis until the failure can be corrected. Continuous use of the radio frequencies currently selected at an operator position, in spite of ICSS failures, is particularly critical.

1.2 Characteristics.

ICSS shall provide at each operator position in a facility the ability to initiate or receive voice communications with other local operators, operators at other facilities, pilots, or any combination thereof.

The basic building blocks of ICSS shall be modular in nature, so that different hardware configurations can be assembled from a minimum number of distinct elements. The exact requirements for each facility and each position therein will be specified by the Government.

Expansion of an existing ICSS, including both the addition of positions and the extension of capabilities at a position, shall be accomplished by the addition of printed circuit cards, plug-in modules and rack assemblies. Such expansions shall not require interruption of service at more than one ATC position at a time. Any ICSS shall be expandable to the maximum configuration.

An operator shall be able to initiate certain intercom and interphone calls by pushing a single Direct Access button. Intercom and interphone calls to other positions, not configured for direct access, shall be placed by means of the Indirect Access keypad. In some cases, an operator shall be able to directly join into an ongoing conversation, thereby establishing a connection on a conference basis. Radio circuits shall be selected for transmission or monitoring by Radio pushbuttons. Selection between main and standby radio transmitters and receivers shall also be provided. Talking on a radio channel shall always require operation of a push-to-talk (PTT) switch. Incoming calls may be directed to either the loudspeaker or the headset, depending upon configuration and the position of the headset/loudspeaker (H/L) pushbutton. Other pushbuttons shall allow calls to be placed on hold, released (disconnected), or forwarded to another position (call forwarding).

Each ATC position shall require a maximum of 40 direct access pushbuttons, plus an indirect access keypad and special function buttons (such as Hold, Release, and Headset/Loudspeaker). Access shall be provided to as many as 48 radio frequencies each for transmission and reception. On each of these frequencies, the operator shall be able to select between main and standby radio transmitters or receivers, as appropriate.

2.0 Performance Requirements.

The Type 3 ICSS shall meet the following minimum performance requirements.

2.1 Position Equipment.

2.1.1 Pushbutton Modules.

Pushbutton modules shall be capable of containing up to 10 pushbuttons. Keycaps shall be available in different colors. Associated with each button for which there is no corresponding alphanumeric display (2.1.2) there shall be provision for retaining plastic designation strips, upon which the designation of the pushbutton (e.g., the name of the party at the other end, the designated radio frequency, or the function of the button) can be written. The strips shall be designed for easy removal and replacement. They shall be transparent, with contrasting lettering, and their housing shall include a transparent protective window. This window shall be back lighted, as shall each separate pushbutton.

Associated with each pushbutton there shall be up to two indicator lights, providing means for signaling status to the operator. These lights shall be made to stay on, wink, flash, flutter or stay off (or glow dim), in accordance with the ATC position operator features, as described in a succeeding section.

All indicator lights and designation strips shall be clearly legible in a broad range of ambient light ranging from total darkness to bright sunlight. All buttons, designator housings and status indicator lights shall be provided with variable backlighting, the intensity of which shall be varied by a dimmer control common for all backlighted equipment at the position.

2.1.2 Display Modules.

Each display module shall contain a number of six character alphanumeric word displays equal to the number of buttons in the pushbutton module. Displays of decimal points, as required (for example, between the third and fourth digits of a radio frequency display), shall not be counted as one of the six required characters. Each display module shall be located adjacent to a pushbutton module. The display module shall be used to augment or supplant the function of the designator strips which identify the purpose of each display word. The display module shall be supplied electronically by the ICSS system.

The 26 upper case letters A - Z and the 10 numerals 0 - 9 shall be displayed in distinct and unambiguous fashion. Display module words shall be legible in a broad range of ambient light ranging from total darkness to bright sunlight. Variable intensity and backlighting, as appropriate, shall be provided.

2.1.3 Indirect Access Module.

The Indirect Access module shall contain a 12 button keypad, with the keys designated IA (Indirect Access), CA (Common Answer), and the numerals 0 - 9. Each button shall have variable backlighting (under common dimmer control). In addition, there shall be three status indicator lights designated OVR (override), CA (common answer) and IA (indirect access), with illumination modes on, wink, flash, flutter and off.

2.1.4 Miscellaneous Function Module(s).

One or more modules shall be included to provide functions which are not replicated at all ATC positions. These shall include loudspeaker, dual telephone jacks, a dimmer control and a footswitch termination.

2.1.4.1 Speaker.

The speaker shall be mounted behind a grill, and shall be able to both reproduce voice signals and generate chimes. The chimes shall be generated at approximately one second intervals by electronic circuitry associated with the speaker, whenever an intercom or interphone call is directed to the position speaker. The chime shall cease when the call is answered. Controls to adjust the chime frequency and volume shall not be accessible from the front panel, but shall be readily accessible for maintenance adjustment. Nominal chime frequencies selectable shall be 500,750,1000,1250 and 1500 Hz. The chime volume control shall limit the chime tone output to a maximum level of 0.3 watt of audio power into a 4 ohm resistive load (representing the speaker). A chime on/off switch and associated indicator light, which are accessible to the operator, shall be provided. A lever shall be provided that clearly indicates whether the switch is in the off or on position.

Two volume controls, accessible to the operator, shall be provided to independently adjust the audio levels to the headset and speaker. With the speaker volume control set fully clockwise (loudest), the output level of the position speaker amplifier shall be a nominal 0.6 watts of audio power into a 4 ohm resistive load (representing the speaker). At this level, the harmonic distortion from the speaker shall not exceed 5 percent for any single frequency between 300 and 3000 Hz. The frequency response of the speaker module shall be in accordance with 2.2.7 (Voice frequency circuits).

Volume to the headset shall be adjustable from 11 dB below the normal listening level to 24 dB above it. The normal listening level is -32 dBm at the headset.

2.1.4.2 Telephone Jacks.

Two telephone jacks occupying minimal space, shall be provided at each position for use with position instruments. One set of jacks shall be clearly designated for use by the operator and the other set shall be clearly designated for monitoring. The monitoring jack shall operate exactly like the operator jack with respect to requirements for push to talk for intercom and interphone. The monitoring jack shall provide a preemption feature whereby the Monitor (typically, the supervisor) can take control of radio transmission by depression of his PTT switch. The impedance at the receiver side of the telephone jack shall be 600 ohms.

2.1.4.3 Position Instruments.

Position instruments shall consist of headsets, handsets, or hand microphones. The headsets shall be Plantronics Model HSO-311-2 (non noise-cancelling) or equivalent, and Plantronics Model SHS 1148-05 (MUFF Style) or equivalent. The headsets shall be Audio Sears #V180103G5BR05T6 or equivalent. Should the offeror decide to replace the herein above Plantronics headsets or handsets by equivalent models, approval by the Government will be required.

Hand microphones shall be equipped with a nonlocking type PTT switch on the microphone housing. It shall be possible to use the hand microphone separately but in association with the position speaker. When the microphone is used, all received audio shall be automatically directed to the speaker.

2.1.4.4 Dimmer Control.

At each position a common dimmer control shall be provided to vary the intensity of illumination of all backlighted buttons and indicators at the position.

2.1.4.5 PTT Footswitch.

A Footswitch shall provide PTT control in parallel with the PTT switch of the position instrument. The footswitch shall be Linemaster Model P/N 635-S or equivalent, and the footswitch plug shall be Switch craft Plug Model No. 227 or equivalent. Should the offeror decide to replace the herein above footswitch or plug with another model, approval by the Government will be required. The footswitch shall be connected through a jack plug into the ICSS position. The footswitch cable shall not interfere with the FAA operator.

2.1.5 Operator Features.

This section describes the procedures and features which shall be provided in the course of initiating, receiving, conducting and terminating conversations in each of the system modes (intercom, interphone and radio).

2.1.5.1 Intercom Communications.

Intercom conversations shall be initiated using direct access (without override), direct access override, or indirect access (with and without override).

2.1.5.1.1 Direct Access (Without the Override Feature).

2.1.5.1.1.1 Initiating.

Direct access intercom calls shall be initiated by depressing a single button. Position A calls B by pushing his button labeled B. This action shall cause the direct access button A at the called position B to flash, and the chimes at B to sound (unless muted at the position). The B button light at position A shall come on.

2.1.5.1.1.2 Receiving.

A position called via direct access intercom shall answer by depressing the direct access key which is flashing. B answers the direct access call from A by pushing his A button. This shall cause his A button light to flutter. The connection shall thereby be established.

2.1.5.1.1.3 In Progress.

When an intercom connection is established, two-way conversation shall be enabled. The capability to provide a Headset/Loudspeaker (HL) transfer pushbutton at each position shall be available. The HL button shall direct intercom and interphone voices either to the headset or the loudspeaker. Alternate pushes of this HL button shall switch the voice signal from the headset (HL light off) to the speaker (HL light on).

The capability to provide an Override Headset/Loudspeaker (OHL) transfer pushbutton at each position shall be available. The OHL button shall direct override intercom and interphone voices either to the headset or the loudspeaker. Alternate pushes of this OHL button shall switch the override voice signal from the headset (OHL light off) to the speaker (OHL light on).

PTT shall not be required for ground/ground communication at any position equipped with radio. PTT shall be required for ground/ground communications at any position not equipped with radio except for override calls.

2.1.5.1.1.4 Terminating.

Either the calling position A or the called position B shall terminate an intercom direct access (non-override) call by either (a) pushing the direct access button a second time, (b) pushing the Release pushbutton at the position, or (c.) pushing any other intercom or interphone direct access button. The indicator lights at both positions (the B light at the A position, and the A light at the B position) shall go out.

2.1.5.1.2 Direct Access (With Override feature).

Some direct access calls shall provide an immediate connection to the called party without requiring any action at the called position.

2.1.5.1.2.1 Initiating.

A direct access override call shall be initiated by pushing a single button corresponding to the position to be overridden. Position A shall call position C with override by pushing his C button. The connection shall then be established whether C was busy (in a previous intercom, interphone or radio conversation) or not. The C light at position A and the A lamp at position C shall both come on. In addition, the override (OVR) lamp at the called position C shall flutter. If the called position C had a conversation in progress, A enters the link in a conference mode, and all parties shall be able to speak to and hear all other, with the exception of a radio operator at a split position. The overriding voice of A shall not be transmitted over radio. Whenever an overriding call enters an existing connection in a conference mode, a zip tone shall sound to alert all parties, except that no zip tone shall ever be transmitted over radio.

2.1.5.1.2.2 Receiving.

A position receiving a direct access override intercom call shall not be required to take any action to establish the connection.

2.1.5.1.2.3 In Progress.

The requirements for direct access intercom calls in progress (2.1.5.1.1.3) shall also apply to this section.

2.1.5.1.2.4 Terminating (Locking Button).

Only the calling position A shall be able to terminate a direct access override intercom call. This shall be accomplished by A either (a) pushing the direct access button a second time, (b) pushing the Release button, or (c.) pushing any other intercom or interphone direct access button. Terminating the direct access override call shall cause the indicator lights at both positions (the C light at the A position, and the A light at the C position) to go off, and shall also extinguish the OVR light at the called position C.

2.1.5.1.2.5 Terminating (Non-Locking Buttons).

For those direct access override buttons configured for non-locking operation, the call shall be terminated when the calling position releases the selected button. The call shall remain in progress only as long as the button is depressed.

2.1.5.1.3 Indirect Access.

2.1.5.1.3.1 Initiating.

The operator shall be able to initiate intercom calls by means of his indirect access keypad, regardless of whether the party to be called is accessible using a direct access button. Indirect access intercom call shall either override the called position or cause a ringdown, depending upon the code number dialed. The operator at position A shall begin a call to D by pushing his Indirect Access (IA) button. This action shall result in the IA light turning on, and a dial tone commencing in the operator headset. If he then keys in a code number assigned to non-override calls to D, the chimes at D shall sound (unless muted at the position) and the Common Answer (CA) light shall flash. Should the called party possess a direct access button corresponding to the caller (for example, if A should call B by means of his indirect access keypad), then the chimes at the called position shall sound and the direct access button light, not the CA light, shall flash.

If the operator at position A keys in a code number for an override call to D, the connection shall be established without ringdown, without any response from D, and regardless of whether D was involved in an ongoing conversation. The OVR lamp at D shall flutter, and if a previous conversation was in progress, a zip tone shall sound and a conference call be established.

2.1.5.1.3.2 Receiving.

A position receiving a non-override indirect access intercom call shall answer by depressing the resultant flashing button, as defined in the preceding section (2.1.5.1.3.1). B shall answer A by pushing his A button. D shall answer A by pushing his CA button. In either case, the flashing light shall then flutter and the connection shall be established.

A position receiving an indirect access override call shall not be required to take any action to establish the connection.

2.1.5.1.3.3 In Progress.

The requirements for direct access intercom calls in progress (2.1.5.1.1.3 and 2.1.5.1.2.3) shall also apply to intercom calls completed via indirect access.

In addition, when an incoming caller encounters a busy condition when trying to access either a recording or a preflight briefing specialist, the call shall be held in queue. The queue shall be defined for the service requested and not a particular briefer so that calls may be handled by the first available briefer or recording service. There shall be an indicator on the briefer's phone which alerts the operator that calls are being held in queue. The queue must be sized to hold one call per ACD trunk.

2.1.5.1.3.4 Terminating.

Indirect access intercom calls shall be terminated by the same means as direct access intercom calls (2.1.5.1.1.4 and 2.1.5.1.2.4). In addition the calling party shall be able to terminate the connection by depressing his IA button a second time. The receiving operator shall be able to terminate the connection, if he has other calls in queue, by depressing his CA button.

2.1.5.2 Interphone Communications.

Interphone calls shall be initiated using direct access or indirect access. Direct access signaling shall include both calls which result in automatic ringdown and those enabling voice call. The override feature shall be provided on dedicated interphone access lines whereby all incoming calls on these lines shall be received and handled in progress in the same way as intercom override calls (2.1.5.1.2). However, the originating party shall be able to disconnect an interphone override call in the same way as an interphone non-override call. Direct access interphone communications shall be either locking or non-locking, as configured at that position. When non-locking operation is configured, the call shall be terminated by releasing the DA button, rather than the termination procedures described below for locking calls.

2.1.5.2.1. Direct Access (Ringdown).

2.1.5.2.1.1 Initiating.

Direct access (ringdown) interphone calls shall be initiated by depressing a single button. Position A calls E1, E2,..., En (where Ei are the positions at the called facility which share the appearances of this ring-down circuit, if it is non-selective) by pushing his button labeled E. This shall cause the direct access button A at the called positions E1,..., En to flash, and the chimes to sound at the one or more of positions E1,..., EN, as specified by the active configuration map. The E button at position A shall come on.

2.1.5.2.1.2 Receiving.

At the called facility, an interphone ringdown call on a non-selective circuit which appears at multiple positions E1,...,EN shall cause (a) the button associated with the calling party to flash at each position E1...,En having the circuit, and (b) one chime to sound out at one or more of positions E1,...EN, as specified by the active configuration map. A position called via direct access interphone shall answer by depressing the direct access key which is flashing. E answers the direct access call from A by pushing his A button. This shall cause his A button light to stay steady on for the duration of the connection which shall thereby be established.

2.1.5.2.1.3 In Progress.

The requirements for direct access intercom calls in progress shall also apply to direct access (ringdown) interphone calls. In addition, a pushbutton labeled HOLD shall be provided which shall establish a hold condition on either Central Office (CO) or Private Branch Exchange (PBX) circuits. When this hold function is used, any other radio, interphone or intercom circuit shall be selectable. It shall be possible to establish a hold condition on multiple CO and PBX circuits at a position simultaneously. The indicator light with each direct access pushbutton circuit in hold shall wink. A connection shall be reestablished by depressing the button associated with a circuit on hold thereby removing the hold condition for that circuit.

2.1.5.2.1.4 Terminating.

Either the calling position A or the called E shall terminate a direct (ringdown) interphone call by either (a) pushing the direct access button a second time, (b) pushing the Release button at the position, or (c.) pushing any other intercom or interphone direct access button. The indicator lights at both positions (the E light at the A position, and the A light at the E position) shall go out.

2.1.5.2.2 Direct Access (Voice Call).

2.1.5.2.2.1 Initiating.

A direct interphone voice call shall be initiated by pushing a single button corresponding to the location to be called. Position A shall call position F by pushing his F button. The F button at A shall come on. The caller A shall then be able to speak directly through the speakers of all positions on that Voice Call circuit. The direct access button lights corresponding to the caller shall flash at all the called positions.

2.1.5.2.2.2 Receiving.

A location receiving a voice call shall hear the voice of the caller through the speaker of all positions configured to that voice call circuit. A position F shall answer by pushing the flashing button associated with the caller A. The caller's voice shall then be transferred to the headset of the answering position, and only the answering position shall be connected to the Voice Call circuit.

2.1.5.2.2.3 In Progress.

The requirements for direct access (ringdown) calls in progress (2.1.5.2.1.3) shall also apply to voice calls.

2.1.5.2.2.4 Terminating.

Either the calling position A or the answering position F shall terminate a direct access voice call by either (a) pushing the direct access button a second time, (b) pushing the Release button at the position, or (c.) pushing any other intercom or interphone direct access button. The indicator lights at both positions (the F light at the A position, and A light at the F position) shall go out.

2.1.5.2.3 Indirect Access.

Indirect access interphone calls shall be initiated, received, handled in progress and terminated in the same manner as prescribed in the section concerning indirect access intercom calls (2.1.5.1.3). Position A shall call position G using his indirect access keypad. Voice call as well ring-down circuits shall be accessible using the indirect access keypad. In addition, indirect access interphone calls using either CO or PBX circuits shall have available the hold function specified in 2.1.5.2.1.3.

2.1.5.2.4 Semi-Direct Access (Ringdown).

It shall also be possible to initiate interphone calls by first pushing a direct access button, which shall access a selected trunk line, and then entering a two or three digit code specifying the particular party at the remote facility. Such calls shall be received, handled in progress and terminated in the same manner as prescribed in the section concerning indirect access intercom calls (2.1.5.1.3). Position A shall call position H by first using a direct access button to select the correct trunk, and then his indirect access keypad to dial a code for H.

2.1.5.3 Radio Communications.

Radio communications shall be provided over one or more frequencies. Individual control shall be provided for selecting and deselecting the transmitter and receiver for each frequency. The operator shall also be provided with controls for the selection of main or standby transmitters and receivers for each frequency.

2.1.5.3.1 Initiating.

Transmission over a selected frequency shall be accomplished by first pushing the transmitter select button associated with that frequency. The XMT indicator light for that button shall come on and stay on (i.e., lock), except for two frequencies designated emergency frequencies, which shall be selected only while the transmitter select buttons are held (i.e., non-locking). The main standby transmitter shall be selected by pushing the transmitter Main/Standby button for that frequency. The selected transmitter shall be indicated by the Main and Standby indicator lights, with the indicator on when the transmitter is selected. Each push of the Main/Standby button causes a switch between the main and standby equipment. The selected main/standby transmitter and receiver status shall be indicated at all positions having access to the channel.

The operator shall broadcast on the selected frequencies by pushing his PTT switch. Operation of the PTT switch shall completely mute the received radio voice, for the active channel, at the radio interface. The transmit status indicator associated with the transmit button shall flutter when speech is broadcast. The status indicator at each other ATC position having this frequency selected shall glow red, and broadcasts from these positions shall be prevented (on this frequency) until the original operator releases his PTT switch. If the PTT switch is activated at any other position which has this frequency selected, a busy tone shall be generated in that position headset.

2.1.5.3.2 Receiving.

Receiving a selected radio frequency shall be accomplished by selecting the desired mode: voice shall be either off, in the headset or in the loudspeaker. Selection shall be made by operating the Headset/Loudspeaker (H/L) switch associated with the particular receiver. The adjacent headset (H) and loudspeaker (L) indicators shall display the selection. However, when the HL button is in "Loudspeaker" position, all receivers selected either headset or loudspeaker shall be directed to the loudspeaker.

Control of the radio receivers at each position shall be provided by means of three position switches for each channel. When all of these switches at an operator position are in their Normal positions, all radio signals on frequencies available at that position shall be broadcast in the headset (or, if none is connected, on the loudspeaker). When the switches for one or more frequencies (other than emergency frequencies) are set to Mute Only, received signals over those frequencies shall be muted at that position only. No Mute Only capability shall be provided on the designated emergency frequencies. When a switch for a frequency is moved to mute all others, all incoming radio channels at that position shall be muted except for the emergency frequency and the channel where the Mute All Others control is operated. The Mute all others position shall be non-locking; when the operator releases the switch, it shall return to the Normal position. Selection between main and standby receivers shall be accomplished by successive operations of the receiver Main/Standby button. The associated Main and Standby lights shall indicate which receiver is selected.

2.1.5.3.3 In Progress.

Radio transmission on active, non-busy frequencies shall occur whenever the PTT switch is operated. Reception shall be directed to the headset, loudspeaker or neither according to the status of the H/L switch. However, when the H/L switch is in the H position, and an intercom or interphone circuit is selected, incoming radio calls shall automatically be terminated in the position speaker. These calls shall revert to the headset when the intercom or interphone connection is ended.

Whenever a voice signal is present on a frequency, the H or L indicator shall flutter.

2.1.5.3.4 Terminating.

A radio transmitter is deselected by pushing the transmitter button for that frequency. The XMT indicator shall go out, and no further broadcasts shall be enabled until the frequency is selected again by pushing the transmitter button once more.

Receptions on a given frequency are inhibited by selecting the voice off condition by means of the H/L button.

2.1.5.3.5 Frequency Preemption.

Selected operational positions shall be able to transmit and receive with preemption capability on specific frequencies which are normally used by the other operational positions. In such instances the preempting position shall, upon activating its PTT, take control of the transmitter being keyed by the preempted position. The preempted position shall receive an indication that its frequency has been preempted.

2.1.5.4 Call Forwarding.

Every position shall be able to forward incoming intercom and interphone calls, including voice calls, to another local position. However, looping or closed circuit forwarding shall be prevented. If the answering position has a direct access button assigned for the forwarded call, it shall be used for answering. If not, the Common Answer (CA) button shall be used. Forwarded calls shall be conducted in accordance with the requirements for intercom communications (2.1.5.1) and interphone communications (2.1.5.2). Call forwarding shall be initiated and cancelled by keying in appropriate codes on the indirect access keypad of the position initiating the call forwarding.

2.1.5.5 Conferencing.

ATC positions shall have the capability to establish conference calls connecting any 10 or fewer conferees. The received audio level at each position shall be independent of the number of positions connected in conference.

2.1.5.6 Automatic Call Distribution.

An Automatic Call Distribution (ACD) incoming call shall be directed to one of four destinations, according to signaling instructions from the caller:

(1) The caller may summon a "menu" or directory, which shall be a prerecorded message providing instructions and information on the further use of the system;

(2) The caller may request an FSS operator;

(3) The caller may request from a Pilot Automatic Telephone Weather Answering Service (PATWAS) any one of 18 prerecorded briefings. Each briefing may be up to three minutes long. This PATWAS shall be supplied by the Contractor as part of the automatic call distribution feature.

(4) The caller may request a "Fast File" recorder, which shall enable the caller to file a flight plan onto a recording device. This recording device shall have the capability to store as many as 24 six minute recordings. This "Fast File" shall be supplied by the Contractor as part of the automatic call distribution feature.

If no operator is available when an incoming call is received, the call shall be placed in a first-in, first-out queue pending the availability of an operator. Similarly, caller requests for automated query response shall be placed in queues according to availability of the desired service. Each queue shall have the capability to be readily adjustable to hold up to 30 incoming calls as specified in the contract schedule. An interface to a music source shall be provided. Audio from this music source interface shall be routed by the system to callers placed in queue and on hold.

Up to 10 simultaneous connections to each of the 18 prerecorded PATWAS briefings are required. The capability of up to 10 simultaneous connections to Fast File recorders are required.

The system shall be capable of placing Fastfile recordings in separate storage areas. Each storage area shall be assignable to an ICSS position for debriefing responsibility. The ICSS operator at an ACD position shall be visually notified when Fastfiles, routed to his position, are available for debriefing. Aural notification of available Fastfiles, as well as a method to defeat this notification by nonlocking control, shall also be provided to ACD positions.

Audible signals of incoming ACD calls shall be provided. One position shall be provided with a monitor which displays the status of the ACD function, including numbers of calls in queue.

The ACD shall provide for the automatic termination of calls to specialist positions when the calling party hangs up. The lack of signaling on the caller's end shall not "tie-up" the briefing specialist. No actions by specialists shall be required to terminate each call.

In case of ACD failure, including power failure, a maximum of eight (8) ACD trunks shall be connected to designated FSS positions.

If an ACD phone is utillized at a radio position, it must be operated in manual mode. ACD calls and radio calls shall not be combined in the headset.

2.1.5.7 Call Transfer.

Each ATC position shall have the capability to transfer any incoming call, except override and radio, to any other position within the facility.

2.1.5.8 Position Instrument Disconnect.

The removal of the position instrument shall establish a nonoperating condition. During this condition, all incoming intercom, interphone and radio calls shall terminate in the speaker. Status indicators and chimes shall continue to operate, but the pushbuttons shall be inoperative. Reinsertion of the position instrument shall restore the position to its previous state.

2.1.5.9 Position Self Test.

A position self test feature shall be provided and activated by dialing a self test code via the indirect access keypad. This feature shall execute test routines in the position which perform diagnostics verifying operational status. Pass or fail indications shall be given as appropriate. In addition, a means for testing all indicator lights shall be provided.

2.1.5.10 Split Radio - Intercom/Interphone Operation.

A pushbutton at designated positions shall permit two ATC operators to simultaneously use one ATC position. Two dual (operator and monitor) telephone jack modules shall be provided at positions designated for split operation. Each telephone jack shall be clearly labeled. In the split mode, the source, termination, and control of radio and IC/IP audio shall reside independently in these two modules. The reception of radio audio in the IC/IP jack module when no IC/IP call is in progress (in a position that is in the split mode) shall be provided. An override call to a position in the split mode shall be directed only to the IC/IP jack module. This split mode shall be instituted when the Split pushbutton is operated, and the associated indicator shall come on. The normal combined mode shall then be obtained only by a second operation of the Split button, which shall also extinguish the Split indicator.

When an ACD agent set is installed, operation of the ACD will remain with the operator jack.

2.1.5.11 Door Release.

A pushbutton shall generate a signal to unlock the facility door.

2.1.5.12 Facility Entrance Intercom.

The facility entrance shall be provided with one or more direct access intercom buttons. The requirements for direct access (non-override) intercom communications (2.1.5.1.1) shall apply to the facility entrance position.

2.1.5.13 Position Monitoring.

Designated positions shall be provided with the capability to simultaneously monitor one or more, up to five other ATC positions. All audio, incoming and outgoing, and including tones from the position being monitored, shall be reproduced in the headset or loudspeaker (as selected by a headset/loudspeaker button) at the monitoring position. No indication shall be given to the monitored position when monitoring is initiated or in progress. Means to select the positions to be monitored either directly or indirectly shall be provided.

One monitor position at each facility shall be provided with a jack into which a GFE recorder (Government furnished) may be connected. The jack outputs shall provide (1) all incoming and outgoing audio from the monitored position, including tones; and (2) voice actuated dry contacts suitable for controlling the recorder. No indication that recording is in progress shall be given to the monitored positions.

2.2 System.

2.2.1 System Start-up Time.

Normal system operation shall ensue within 30 seconds of the application of power, after any power-off condition.

2.2.2 Push-to-Talk Switching Time.

The time interval from the closure of the position PTT contacts until a keying signal appears at the system PTT interface terminals shall be less than 50 milliseconds (ms) for any selected radio channel.

2.2.3 Transmitter and Receiver Main/Standby Selection.

The time interval from the actuation of the Main/Standby selection switch until a switching signal appears at the system interface terminals shall be less than 50 ms for any selected radio channel.

2.2.4 Intercom Direct Access Selection (Non-Override).

The time interval from the actuation of an intercom Direct Access button to the actuation of the chime at the called position shall be less than 150 ms.

2.2.5 Intercom Direct Access Override Selection.

The time interval, from the selection of a direct access override key until the ZIP tone begins at the called and calling positions, shall be less than 150 ms.

2.2.6 Interphone Direct Access selection.

The time interval from the actuation of a direct access interphone button until the position is connected to the trunk shall be less than 100 ms.

2.2.7 Voice Frequency Circuits.

The characteristics required and specified herein for voice frequency (VF) circuits apply to ICSS equipment only, and do not include leased or Government owned transmission facilities (trunks, etc.,) which may be connected to the ICSS.

2.2.7.1 Impedance.

Each voice frequency circuit within the system shall present a 600 ohm impedance balanced to ground, to its interface with a leased Government owned trunk circuit (transmission facility) at the point of demarcation. A minimum return loss of 26 dB over the frequency range of 300 Hz to 3000 Hz shall be provided. Over this frequency range the longitudinal balance shall be 40 dB minimum. These requirements apply to both two-wire and four-wire interfaces.

2.2.7.2 Noise.

The combined hum and noise level of any single VF circuit, measured at the instrument jacks or voice path interfaces with external equipment or transmission facilities with both ends of the path properly terminated, shall not exceed +40 dBrnCO. Noise shall be measured with a Western Electric 3 A Noise Measuring Set through a C-message weighting filter, or the equivalent.

2.2.7.3 Impulse Noise.

The peak level of impulse-type noise generated within the system when measured on a single path of an idle VF circuit, with both ends of the circuit properly terminated, shall not exceed three hits within a three minute period above a level of +40 dBrnO. Impulse noise shall be measured with a General Radio 1556A Impulse Noise Analyzer, or the equivalent.

2.2.7.4 Crosstalk and Isolation.

The crosstalk level between any two voice frequency transmission paths within the ICSS shall not exceed -60 dB. The intercom, interphone and radio signals shall be isolated from each other by at least 60 dB.

2.2.7.5 Frequency Response.

The voice signal amplitude at frequencies between 300 to 3000 Hz shall be within pulse or minus 2 dB of the 1000 Hz plus or minus 25 Hz amplitude level. Frequency attenuation roll-off characteristics of voice frequency paths below 300 Hz and above 3000 Hz shall be at a minimum rate of 6 dB per octave.

2.2.7.6 Harmonic Distortion.

The total end-to-end harmonic distortion produced in a voice circuit by any single frequency between 300 and 3000 Hz applied at a level of -3 dBmO shall not exceed 2.5 %.

2.2.7.7 Intermodulation distortion.

The rms sum of all intermodulation products resulting from any two frequencies between 300 and 3000 Hz when applied to a VF circuit at a level of -3 dBmO shall not exceed 2.5%.

2.2.7.8 Radio Channel Characteristics.

Each radio receive channel shall be capable of accepting a -8 dBm nominal transmission level from the radio trunk. Each receive channel shall provide a manual adjustment feature, readily accessible to maintenance personnel, to compensate for level changes within the range of +3dBm to -33dBm. In conjunction with the push-to-talk, the associated radio receiver signals shall be muted for the duration of the push-to-talk function. Each radio transmit channel shall deliver a 0 dbm nominal transmission level to the radio trunk with a provision for manual adjustment to nominals within the range of +3 dBm to -10 dBm. In establishing communications from the system to live radio trunks, the push-to-talk mode shall provide a closure with the capability to switch up to 100 milliamperes to signal ground, with a leakage in the OFF state not to exceed 0.1 milliampere.

2.2.8 Voice Frequency Level Regulation.

The level of voice frequencies between 300 and 3000 Hz when transmitted and received at positions shall be regulated as follows.

2.2.8.1 Transmit Level Regulation.

Automatic voice level regulation shall be provided in all transmitting voice paths from any position to maintain the output signal level within ±2.0 dB of the test level, which is defined as -15 dBm at the position headset jack. The level regulation shall be maintained over a range of ±6dB from the test tone. A 12 dB sudden increase or decrease shall affect the output level in accordance with the following. The nominal transmit level for interphone and radio signals at the demarc shall be 0 dBm.

12 dB Sudden Increase (-6 dB below to +6 dB above the test tone) - The instantaneous output level, including transients, shall not increase by more than 5 dB or decrease by more than 3 dB. The output level shall be within ±0.5 dB of the final steady state value within 10 ms from the instant of input level change.

12 dB Sudden Decrease (+6 dB above to -6 dB below the test tone) - Immediately following the 10 ms stabilization period after the 30 dB increase, and with a sudden 30 dB decrease, the output shall stabilize to within 3 dB of the final steady state value in not less than 400 and no more than 800 ms from the instant of input level change. The input signal level shall be no greater than +10 to -20 dBm.

2.2.8.2 Receive Level Regulation.

With up to a ±8 dB change in the received level of an interphone or radio test tone signal, the received signal shall remain within plus or minus 1.5 dB of the nominal receive level. The nominal receive level for interphone signals at the demarc shall be -16 dBm. Surge protection shall be provided at the jack module to prevent any signal exceeding a peak value of 100 dB SPL from reaching the headset or handset.

2.2.8.3 Sidetone.

The sidetone level shall be 16 dB below the nominal transmit level of the position jack. When a position is transmitting, the sidetone leakage as measured across the speaker terminals shall be at least 50 dB below the transmitted audio level set by the speaker volume control.

2.2.9 Information Tones.

The information tones generated by the system shall be in accordance with Table 1.

2.2.10 Pushbutton Signaling Tones.

Pushbutton signaling tones shall be in accordance with Table 2.

2.3 Interface Equipment.

Interface equipment shall be provided in ICSS Type 3 for both interphone connections to trunk circuits and radio signals to Government furnished transmitters and receivers. This equipment shall be in compliance with Part 68 of Federal Communications Commission (FCC) rules.

2.3.1 Interphone Universal Trunk Interface Equipment.

Universal trunk interface equipment shall be provided to permit the interphone circuits to interface with telephone systems and equipment external to the ICSS on both a two wire and four wire basis. The universal trunk interface shall include signaling equipment, jack circuits and protection equipment. The type of trunk interfacing to be used depends upon the supervision requirement of the external system, and shall be provided in accordance with the contract schedule.

2.3.1.1 Types and Trunk Interface Equipment.

Trunk interface equipment shall be modular and shall be compatible with all types of Government furnished trunk circuits listed herein, in any combination.

2.3.1.1.1 Nonselective Circuit.

Nonselective private line circuits will be made available as required and shall be used for point-to-point communications between the local facility and distant locations. Outgoing calls may have automatic signaling or manual ring (by means of a Ring and Flash key), depending upon the type of equipment at the distant end. However, the circuit shall be capable of being voice called where speaker termination is provided. Distant end equipment may be any of the following:

a. Another interphone switching system.
b. Instrument set.
c. Local Private Branch Exchange (PBX).
d. Key equipment
e. Speaker -- alone or in conjunction with any of the above.

2.3.1.1.2 Selective Signaling (SS-1A/SS-4) Circuits.

Signalling shall be provided by dialing both positions within the system and remote stations external to the system. Dialing will be used to signal any station on the circuit.

Table 1. Information Tones

Signal	Frequencies (Hz) (±0.5%)	Power per Frequency (dBm0) (±1.5 dB)	Interruption Rate	Tone-On (Sec)	Tone-off (Sec)
Dial Tone	350 + 440 (Mixed)	-16	Continuous	-	-
Line Busy	480 + 620 (Mixed)	-24	60 IPM	0.5	0.5
ACD Error	480 + 620 770 + 880	-18.5	Alternating	0.5	-
ACD Internal Dial	525 + 660	-18.5	Continuous	-	-
ACD Holding Tone	480	-18.5	Continuous	-	-
ACD Howler	941 + 1209 942 + 1477	-6.5	Alternating	1	-
ACD Call Alert	770 + 880	-18.5	One burst	.2	-
Invalid	480 + 620 (Mixed)	-24	120 IPM	0.2	0.3
Audible Ringing Routine	440 + 480 (Mixed)	-16	10 IPM	2.0	4.0
ZIP	350 + 440	-16	One burst	0.2	-
Beep 17 (NOTE 1)	1400	-16	Repeated burst	0.3	15

Note 1: The beep tone shall be delayed at least 15 seconds after the completion of dialing. When so specified in the contract schedule, the beep tone requirement shall be deleted.

Table 2. Pushbutton Signaling Tones

Digit	Pushbutton Designation	Tone Pair
Digit 1	1	697 and 1209
Digit 2	2	697 and 1336
Digit 3	3	697 and 1477
Digit 4	4	770 and 1209
Digit 5	5	770 and 1336
Digit 6	6	770 and 1477
Digit 7	7	852 and 1209
Digit 8	8	852 and 1336
Digit 9	9	852 and 1477
Digit 0	0	941 and 1336
Spare (may be used for C digit)		941 and 1209
Spare		941 and 1477

2.3.1.1.3 Central Office (CO) and PBX Extension Circuits.

These circuits shall be selective outgoing and nonselective incoming and shall interface with CO lines or PBX extension, two-wire lines. The circuit shall be equipped with a hold feature and shall be of either the rotary or pushbutton type.

The CO lines shall provide direct connection to the local telephone network. Either type line shall be selectable from any position.

2.3.1.1.4 PBX Tie Line.

This circuit shall be selective both inbound and outbound, and shall be capable of interfacing with a CO line, PBX extension or a local facility administrative phone system. A hold feature shall be provided for this circuit. This circuit shall be either dial pulse or Dual Tone Multi-Frequency (DTMF).

2.3.1.1.5 Local Dial Line Circuit.

This circuit shall provide a two-way communication or incoming-only communication with local vicinity points (such as airline offices) that can dial select a given position at the facility. Outgoing calls shall use a manual ring-down, automatic ring-down or voice call signaling. Incoming calls shall use dial signaling.

2.3.1.1.6 Voice Call Circuit.

A voice call circuit shall provide high priority communications between certain ATC facilities. Speaker termination shall be provided by the Contractor at the ICSS end. The Government will furnish necessary terminations at non-ICSS sites. Voice call signaling shall ensure immediate contact regardless of a busy condition at the called position. To reply, the called party must "pick up" the circuit.

2.3.1.1.7 Remote Override Circuit.

This circuit shall provide priority communications between facilities by means of an override call. Such calls shall originate at an ATC facility and shall be connected to the headset or position speaker of the designated position in another facility. The remote stations must have the proper signaling equipment for this circuit.

2.3.1.1.8 System Maintenance Status Circuit.

A circuit shall be provided for transmitting system maintenance status to a remote maintenance facility. The ICSS interface to this circuit shall conform to the requirements for NAS-MD-790-ICD-1. Asynchronous transmission is permissible at or below the rate of 1200 bps.

2.3.1.1.9 Voice-in dial-out circuit.

A circuit shall be provided for voice calling inbound and dial signaling outbound from ICSS. Speaker termination shall be provided by the Contractor at the ATC positions. The Government shall furnish termination at non-ICSS sites.

2.3.1.2 Trunk interface signaling requirements.

Both supervisory and control signaling shall be provided for the trunk interface. Required signaling types are specified in this section. The contract schedule shall specify individual configurations.

2.3.1.2.1 Supervisory signaling.

Supervisory signaling equipment shall be modular, such that changes in supervision types shall require only module replacement. Supervisory signaling shall be provided by Single Frequency (SF) modules, Duplex (DX) signaling modules, E&M signaling modules and Dry Contact modules, as specified herein. 20 Hz to E&M signaling conversion shall be provided where required.

2.3.1.2.2 SF signaling.

SF signaling shall be provided for transmission of supervisory and control signals over two-wire and four-wire voice frequency channels without interfering with their use for speech.

2.3.1.2.3 DX signaling.

DX signaling shall be provided to interconnect E&M signaling and supervision circuits when the metallic resistance between the ends of a trunk circuit exceeds operational limits. DX signaling shall operate over a trunk circuit with a resistance of 600 ohms or less and shall be balanced and symmetrical.

One wire of the pair shall be used for signaling and the other to compensate for differences in ground potential and for variations in battery voltages.

2.3.1.2.4 E&M signaling.

E&M signaling shall be provided to enable direct use of E&M supervision on facilities leased from the common carrier or provided by the user. DC conductor resistance in the E lead and M lead shall be limited to 25 ohms or less. The following convention shall be used on the E&M signal or the line side of the E&M signaling module. When the trunk state is On Hook, the E lead shall be open and the M lead grounded. When the trunk state is off hook, the E lead shall be grounded and the M lead shall be 48 volt DC.

2.3.1.2.5 Dry contact signaling.

Dry contact signaling shall be capable of providing an indication of the on-hook/off-hook status of a line/trunk from common carrier facilities. All applicable tariff and interconnection agreements shall be met in providing this capability. The dry contact module shall pass pulse dial signaling as required.

2.3.1.2.6 20 Hz to E&M signaling.

20 Hz to E&M signaling shall convert incoming 20 Hz or 30 Hz ringdown signaling to E lead control and shall convert outgoing M lead control to outgoing 20 Hz or 30 Hz ringdown signaling. It shall accommodate two-wire and four-wire interfaces. The ICSS ringing receivers shall accept ringing signals within the following limits:

20 Hz : 55V RMS minimum, 130 V RMS maximum;

30 Hz : 75V RMS minimum, 130 V RMS maximum;

As measured with the circuit terminated into 10k ohms at the ICSS interface.

2.3.1.2.7 Control signaling.

Control equipment shall operate with dial pulse signaling, DTMF signaling and Multifrequency (MF) signaling. The type of control signaling used on a particular trunk shall be specified in the contract schedule.

2.3.1.2.7.1 Dial pulse signaling.

Trunk circuits shall be capable of receiving or transmitting dial pulse information. Received dial pulses at rates from 8.0 to 12.0 pushes per second, with a 25 to 75 percent break, will be acceptable. Outgoing dial pushes shall be transmitted at 9.5 to 10.5 pulses per second with 58 to 62 percent break. The interdigital time between the last pulse of a digit and the first pulse of the next digit shall be a minimum of 600 ms. After the receipt of the appropriate start or go signal on a trunk, the system shall delay the transmission of the first pulse on the trunk a minimum of 70 ms.

2.3.1.2.7.2 DTMF signaling.

Trunk circuits shall be capable of transmitting and receiving DTMF signals. Table 2 specifies the pushbutton digits, designations and corresponding tone frequencies.

2.3.1.2.7.3 MF signaling.

Trunk circuits shall be capable of transmitting and receiving both non-confirmation and confirmation MF signals. The digit designations and frequencies used are specified in Table 3.

2.3.1.3 Common carrier circuit interfaces.

The system shall interface and operate with the common carrier tariffs specified herein, and with their equivalents.

2.3.1.3.1 Tariff FCC No. 259.

Circuit Characteristics and Service Requirements.

2.3.1.3.2 Tariff FCC No. 260.

Private Line Service Transmission Characteristics for Voice Bandwidth Circuits.

2.3.1.3.3 Tariff FCC No. 263.

Long Distance Message Telecommunications Service. Two-wire or four-wire circuits shall be used for communications to local PBX, intrastate and interstate voice communications. Tariffs to be used will be approved by the individual state or municipal public utilities commissions which govern the locale serving the ATC facility. Access to the interstate long distance message telecommunication service per Traffic FCC NO. 263 will be provided subject to approval and establishment of this service with the local common carrier. Circuits requiring signalling to external PBXs shall exchange dual mode when required.

2.3.2 Air/Ground Communication interface equipment.

Equipment shall be provided for ICSS to interface with Government furnished transmitters and receivers, which may be located both locally and at remote sites.

The ICSS systems shall be capable of interfacing with Remote Transmitter/Receiver (RTRs), Remote Communication Outlet (RCOs), and Remote Center Air Ground Communication Facility (RCAGs), plus Limited Remote Communication Outlets (LRCOs), Voice-frequency Omnidirectional Radios (VORs), Direction Finders (DFs), and second-generation Collocated VHF Omnidirectional Range and Tactical Air Navigation Facility (VORTAC) Monitoring Systems.

Various types of interfaces, with differing control capabilities, are required to connect ICSS to these different facilities. These interfaces shall be modular and shall provide all signaling necessary to control the remote transmitters and receivers.

These interfaces are numbered arbitrarily below where the requirements for each are specified.

Table 3. MF 2/6 Signaling

Digit	Frequency (Hz)
1	700 + 900
2	700 + 1100
3	900 + 1100
4	700 + 1300
5	900 + 1300
6	1100 + 1300
7	800 + 1500
8	900 + 1500
9	1100 + 1500
0	1300 + 1500
KP (NOTE 1)	1100 + 1700
ST (NOTE 2)	1500 + 1700
ID (NOTE 3)	1300 + 1700

Notes

Note 1: A key pulse (KP) shall be used to prime the common control tone receiving equipment in the switching center.

Note 2: A start pulse (SP) shall be used to signal the end of pulsing or call heading information.

Note 3: An interdigital pulse (IP) shall be used between digit pulses in the confirmation mode.

2.3.2.1 Interface 1: Direct Connection.

When radio transmitters and receivers are located in proximity to the ATC facility, they may be connected directly rather than over trunk lines. In those cases eight pairs of wires shall be used:

a. a pair for the VF signal to the main transmitter
b. a pair for the VF signal to the standby transmitter
c. a pair for the VF signal from the main receiver
d. a pair for the VF signal from the standby receiver
e. a pair for the PTT control for the main transmitter
f. a pair for the PTT control for the standby transmitter
g. a pair for controlling the switching of a single antenna between main and standby transmitters.
h. a pair for controlling the switching of a single antenna between main and standby receivers.

Interface 1A shall provide signals and control for these eight wire pairs, applying 48 VDC across the selected PTT control pair when the transmitter is keyed, and an open circuit otherwise.

Interface 1B shall provide signals and control for eight wire pairs, applying a short circuit across the selected PTT control pair when the transmitter is keyed, and an open circuit otherwise.

2.3.2.2 Interface 2: Tone control.

When radio transmitters and receivers are located remotely, they may be connected over trunk lines. In those cases the ICSS shall include the interface to in-band tone signaling equipment which generates controls.

2.3.3 Voice recording interface.

All incoming or outgoing intercom, interphone and radio communications at a position shall be combined into a single signal for recording. This recorded signal shall at all times consist of what the position operator hears in the headset. The outputs for speakers and headsets shall have common processing with the output for recording. The signal level provided at the recorder input interface shall at all times be the same as the level at the position headset. The recorder shall be Government furnished.

When split radio - intercom/interphone operation is specified for a position, separate as well as combined recording channels shall be provided for radio and intercom/interphone.

2.4 Configuration Control Equipment.

Equipment shall be provided to enable the reconfiguration of the ICSS at a facility. Reconfiguration in this context refers to changes in connectivity and consequent functional rearrangement, but not to adaptations the system might undergo (such as switching to a redundant circuit element) in efforts to maintain availability. The facility shall be reconfigured by instruction from a supervisory position. The reconfiguration process shall not interrupt either any call in progress or the function of indicators and controls unaffected by the reconfiguration. Reconfigurable parameters shall include the following:

a. Intercom, Interphone, and trunk terminations for DA buttons.

b. Radio frequencies and associated main/standby equipment selection capability available at a ATC position.

c. The functions of the special function pushbuttons.

d. The alphanumeric message in display modules, where used.

2.4.1 Program Controlled Configuration.

The reconfiguration of the ICSS systems shall be automated and under the control of a designated operator. The ICSS systems shall also automatically adapt the system configuration in response to the addition or deletion of operator positions. A minimum of 10 maps, which are data sets used to define particular configurations, shall be retained in digital storage. When a reconfiguration occurs, visible and audible indications of reconfiguration shall be provided at each affected position. One or both of the following levels of sophistication in configuration control hardware shall be provided for each ICSS. Reconfiguration activation of a single operator position (local reconfiguration) and reconfiguration activation of the entire ICSS (global reconfiguration) and shall be accomplished within one second.

2.4.1.1 Indirect access keypad control.

Selection and implementation of new configuration maps from a designated supervisory ATC position shall be accomplished by entering code sequences into the indirect access keypad. Firmware or software storage of available maps and the control hardware necessary to implement the requested reconfigurations shall be provided. The means to produce new maps shall also be provided, although not necessarily by the operational system.

2.4.1.2 Interactive terminal control.

An interactive terminal shall be provided from which an operator can select and execute reconfigurations from among available maps, or as defined by the operator. The terminal equipment shall include a keyboard, data display, non-sequential bulk storage device, printer and necessary control hardware and software.

2.5 Traffic data collection.

A Time Management Information System (TMIS) shall be provided interfacing with the ACD and the VRS for traffic data collection and analysis. The systems shall automatically generate reports at preset times, including selectable operational parameters, without interruption of the data collecting process.

2.6 Voice recording interface.

All incoming or outgoing intercom, interphone and radio communications at a position shall be combined into a single signal for recording. This recorded signal shall at all times consist of what the position operator hears. The outputs for speakers and headsets shall have common processing with the output for recording. The signal level provided at the recorder input interface shall at all times be the same as the level at the position headset. The recorder shall be Government furnished.

2.7 Maintenance and Diagnostic Equipment.

Internal hardware and software shall be included which can facilitate diagnosis of system status and assist maintenance efforts by alerting personnel to actual or impending failures. Fault isolation down to the lowest possible level shall be provided.

A maintenance position shall be supplied when ordered by the Government to allow access to any radio frequencies and telephone lines within the facility. The maintenance position shall include an indirect access keypad, dual-jack module, speaker module, direct access buttons, four radio frequencies, and associated frequency display.

2.8 Power System Equipment.

An uninterruptible power supply (UPS shall be provided which shall detect AC Power line failures and supply to the system all required power to sustain operation under full load conditions for a minimum of 15 minutes. The transition to and from the UPS shall not degrade the operational and performance requirements of the system, nor shall transient effects occur. Whenever the Contractor supplies equipment which is located beyond the area serviced by the system UPS, a separate UPS shall be provided at each such location.

2.9 Cabling.

The Contractor shall provide all necessary intraconnecting and interconnecting cables and connectors for voice, control and power. Cabling to position module

holders shall be terminated in plug-in connectors. Cabling to remote sites shall be furnished by the Government, unless such cabling is not currently available and provides connections to remotely located contractor-supplied equipment.

2.10 Administrative Telephone System.

This Administrative telephone system shall be able to service single-line, multi-line, push button and DTMF instruments. Additionally, it shall have the capability to serve up to twenty-four (24) telephone trunks (DP/DTMF), and sixty-four (64) extensions within the facility and its remote sites. Features such as speed-dial, re-dial, auto recall, call forwarding, hold, call transfer, intercom calling, call queuing, as well as external audio input and output ports shall be provided by the system.

2.11 Switching Equipment.

Switching equipment shall be provided which shall implement the required features of the system as delineated in this document.

3.0 Physical Characteristics.

3.1 Modularity.

The ICSS shall be modular in construction so that operating positions, radio channels and interphone trunk circuits may be added or removed incrementally without system disruption. Expansion shall be accomplished by the addition of printed circuit cards, plug-in modules, rack subassemblies and racks.

3.2 Cabinet and frame construction.

The equipment room racks cabinets and frames shall not exceed 84 inches in height, 36 inches in width and 30 inches in depth. The cabinets and frames shall not apply an average weight distribution or floor loading exceeding 125 lb/square foot. The structural strength and rigidity of the cabinets and frames shall be such that normal handling in loading, shipping, unloading and setting into position shall not result in any permanent set or deformation which would impair or interfere with the removal or addition of modules. Interchanging of equipment and modules shall not cause any permanent set or deformation to the cabinet frames. The structural strength and rigidity of all cabinets shall be independent of any strength or rigidity provided by access doors. Forced ventilation, where required, shall exhaust from the tops of the cabinets. All equipment cabinets and frames, including those at remote locations, shall be fastened to the floor.

3.3 Demarcation chassis. A chassis serving as an ICSS demarcation at the Government site shall be provided by the Contractor. The cabling from the system to the chassis shall be provided by the Contractor.

3.4 ATC position equipment.

The position equipment shall be installed in the panel areas provided by the FAA (Appendix A). It shall be possible to install all position equipment

necessary for the maximum Type III configuration in this space, including 40 direct access buttons with alphanumeric displays, buttons and displays for 48 radio frequencies each for transmission and reception (both main and standby), all special function buttons, the indirect access module, speaker, telephone jacks, dimmer and any other necessary equipment. All pushbuttons shall provide tactile feedback.

3.5 AC supply voltages.

The Government shall provide at attended facilities 120 VAC, single phase and 208 VAC, three phase 4-wire 60 Hz power. At unattended facilities only 120 VAC, single phase 60 Hz power shall be available. Ten percent variations in either line voltage, or line frequency, or both, shall not affect system operation and performance.

3.6 Power consumption.

The equipment room portion of the ICSS shall not require more than 15 KVA of electrical power.

3.7 Environmental conditions.

All ICSS components shall operate within specification limits during and after exposure to the environments given in 3.7.1 and 3.7.2.

3.7.1 Operating environment.

a. Temperature: 50 - 100 degrees F
b. Relative humidity: 10% - 80% non-condensing
c. Altitude: Up to 10,000 feet
d. Maximum temperature gradient: 15 degrees F per hour

3.7.2 Non-operating environment.

Transportability considerations shall be in accordance with MIL-P-9024 paragraphs entitled "Transportability", "General requirements", "Preparation for movement and handling", "Railway transportation", "Shock-vibration transmission", "Natural environment", and "Hazardous dangerous materials".

3.8 Design and construction.

The ICSS shall be in accordance with good commercial practices for communication systems of this type. The use of electromechanical relays shall be minimized throughout the ICSS.

The ICSS shall be off-the-shelf, modified off-the-shelf or engineered off-the-shelf.

3.9 Interchangeability.

All components, assemblies, subassemblies, and modules that are identical with respect to fit, form and function shall be interchangeable.

3.10 System reliability, maintainability and availability.

Failure sensing, status indicators and alarms shall be provided to meet the requirements of this description and automatically alert operating personnel to system and component failures. All normal maintenance shall require only one technician.

3.10.1 Preventive maintenance.

Preventive maintenance on all ICSS elements shall be limited to cleaning, inspection, adjustments and replacement of parts in accordance with their service lives or as found necessary during inspection.

3.10.2 Corrective maintenance.

Corrective maintenance shall be performed by the replacement of defective modules, assemblies or printed circuit boards. Subsequent repair of such modules shall be performed at the convenience of maintenance personnel. Maintenance of position equipment shall be performed without affecting the operation or performance of any other position. Where redundant equipment is incorporated to provide improved availability, switching to the back-up element shall not disrupt system operations for more than 1 second, nor shall it interrupt any ongoing conversation. Maintenance of off-line redundant equipment shall be performed without affecting the ongoing operation of the system. Automated diagnostic techniques, centralized maintenance control and fault isolation equipment shall limit the time required for fault detection, isolation, testing, repair and restoration of service. Only standard hand tools and a minimum of external test equipment shall be required for corrective maintenance. Requirements for tuning and adjustment shall be minimized. In no case shall the maximum time to repair any fault except for those in mechanical peripheral equipment exceed 0.5 hours. Any failure of a component to perform its intended function, regardless of whether it has an immediate adverse operational impact, shall be considered a fault. The maximum time to replace high-wear components including switches and indicator lights shall not exceed 15 minutes. Electromechanical peripheral equipment, such as tape and disc drives, shall have proven reliability and maintainability.

3.10.3 Availability.

Availability of each radio, communication function, interphone communication function and intercom communication shall equal or exceed 0.9999. For the purposes of this computation, the availability of Government furnished radio equipment and trunk circuits shall be assumed to be 1.0. Any maintenance action, either corrective or preventive, which interrupts service shall be charged against availability.

3.11 Materials, processes, and parts.

3.11.1 Toxicity.

The materials chosen shall be of low toxicity not having dangerous gasses due to fire or toxic effects when used in a normal manner.

3.11.2 Fungus.

The materials chosen shall be non-nutrient to fungus and insects, flame resistant, non-hydroscopic, and not adversely affected by the environmental conditions specified herein before.

3.11.3 Used Parts.

All parts and materials used in the equipment shall be new.

3.11.4 Glass.

All glass used in the equipment shall be shatterproof glass, and shall be clear and free of distortion at all viewing angles.

3.11.5 Cabinets.

The equipment cabinets shall be constructed to maximize attenuation of electronic and magnetic field radiation outside the cabinet due to operating equipment inside the cabinets. The cabinets shall also be designed and constructed to maximize attenuation of electric and magnetic field radiation inside the cabinet due to the operating equipment outside the cabinets.

3.12 Finishes.

All equipment racks and cabinets shall be fully painted on all interior and exterior metal surfaces. All surfaces shall be prime painted in a neutral color. All exterior surfaces shall be finish painted, and free from burrs and sharp edges.

3.13 Cooling.

All of the equipment-equipment shall use simple cooling techniques based on conduction, radiation, and free convection, using room air, to the maximum extent possible. Equipment requiring separate dedicated cooling systems shall not be used. Forced air cooling shall be used only when free air cooling is inadequate. All equipment shall operate whether the doors are open or closed.

No forced air cooling shall be used in position equipment. No external ducts shall be required. Audible and visual overheat warning devices shall be provided as appropriate. Any such audible alarms shall be provided with an overriding inhibit switch.

3.14 EMI electrical design considerations.

All equipment shall be electrically constructed to minimize electric and magnetic field emissions and to minimize equipment susceptibility to electric and magnetic fields. The Contractor shall locate and correct any problems occurring in ICSS equipment performance due to susceptibility of equipment to emissions from other ATC equipment. The Contractor shall locate and correct any operational deficiencies in Contractor provided equipment when the Government has determined that the Contractor's equipment is responsible for an EMI problem in other NAS facility located equipment.

3.15 Safety.

The design of all element of the System shall provide protection against personal injury and equipment damage. All hardware shall comply with the U.S. Department of Health, Education and Welfare X-Radiation Safety Rules, 21 CFR, subchapter J.

3.16 Transient protection and grounding.

The design of ICSS equipment must provide for transient protection, lightning protection, grounding, bonding and shielding requirements as specified in FAA Standards 019 and 020. Theoretical considerations and design guidelines for effecting this protection are included in FAA Order 6950.19 and 6950.20.

APPENDIX A

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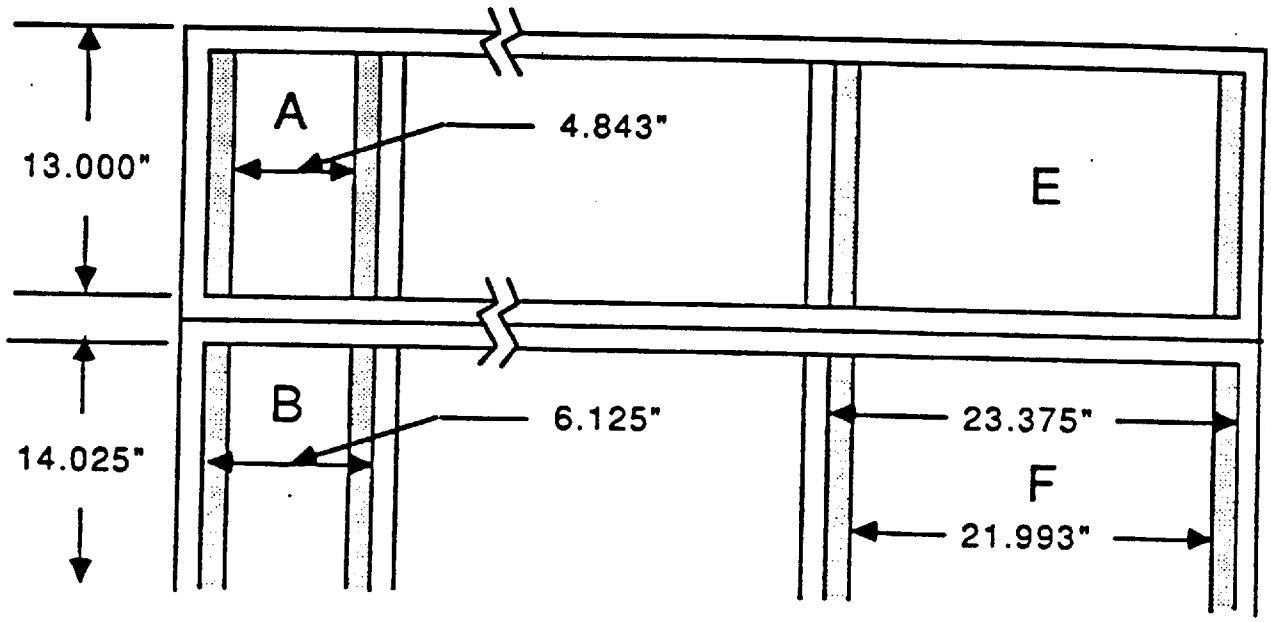
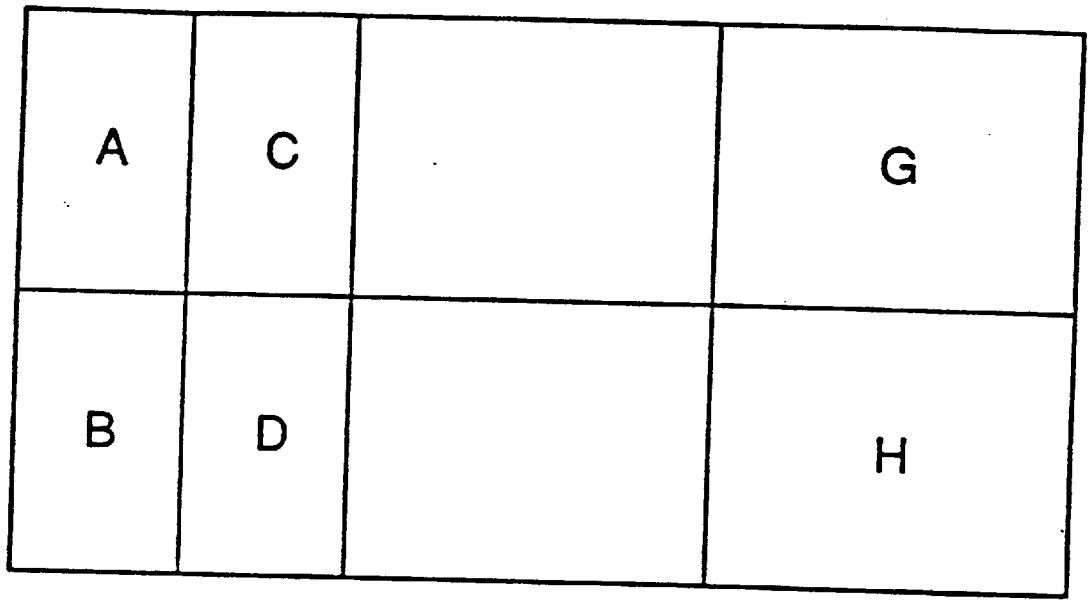


AREA	CLEAR FOR EQUIPMENT INSTALLATION H W D
A	13.000" X 4.843" X 18"
B	14.025" X 4.843" X 18"
E	13.000" X 21.993" X 18"
F	14.025" X 21.993" X 18"

APPENDIX A



AREA	CLEAR FOR EQUIPMENT INSTALLATION H W D
A	12.500" X 4.600" X 18.000"
B	14.000" X 4.600" X 18.000"
C	12.750" X 14.900" X 18.000"
D	14.000" X 14.900" X 18.000"
G	12.900" X 22.800" X 18.000"
H	14.000" X 22.800" X 18.000"